Perinatal death: epidemiology and etiology

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Summary

Epidemiology

- Over 130 million babies are born every year
- About 3 million die in the first 7 days of life
- There are about 3.2 million stillbirths (2.08 to 3.79)

Mean perinatal mortality rate worldwide
21.5/1000 livebirths + stillborn

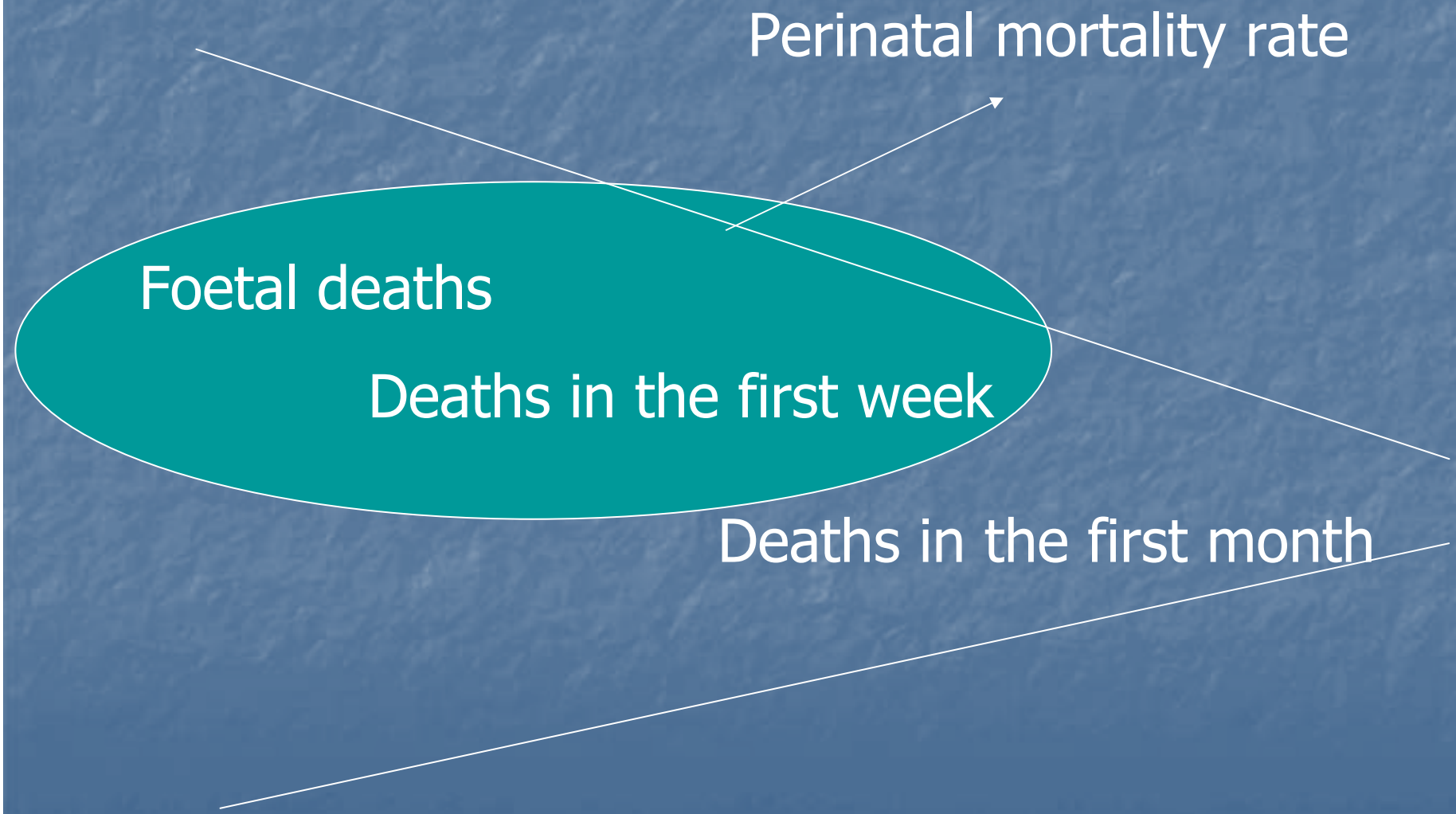
Epidemiology

- There is a wide gap in stillbirth rates between high-income countries - 2/1000 births in Finland - and low-income regions – 40/1000
- 98% of stillbirths occur in low and middle-income countries
- 1.2 million of stillbirths occur during labour

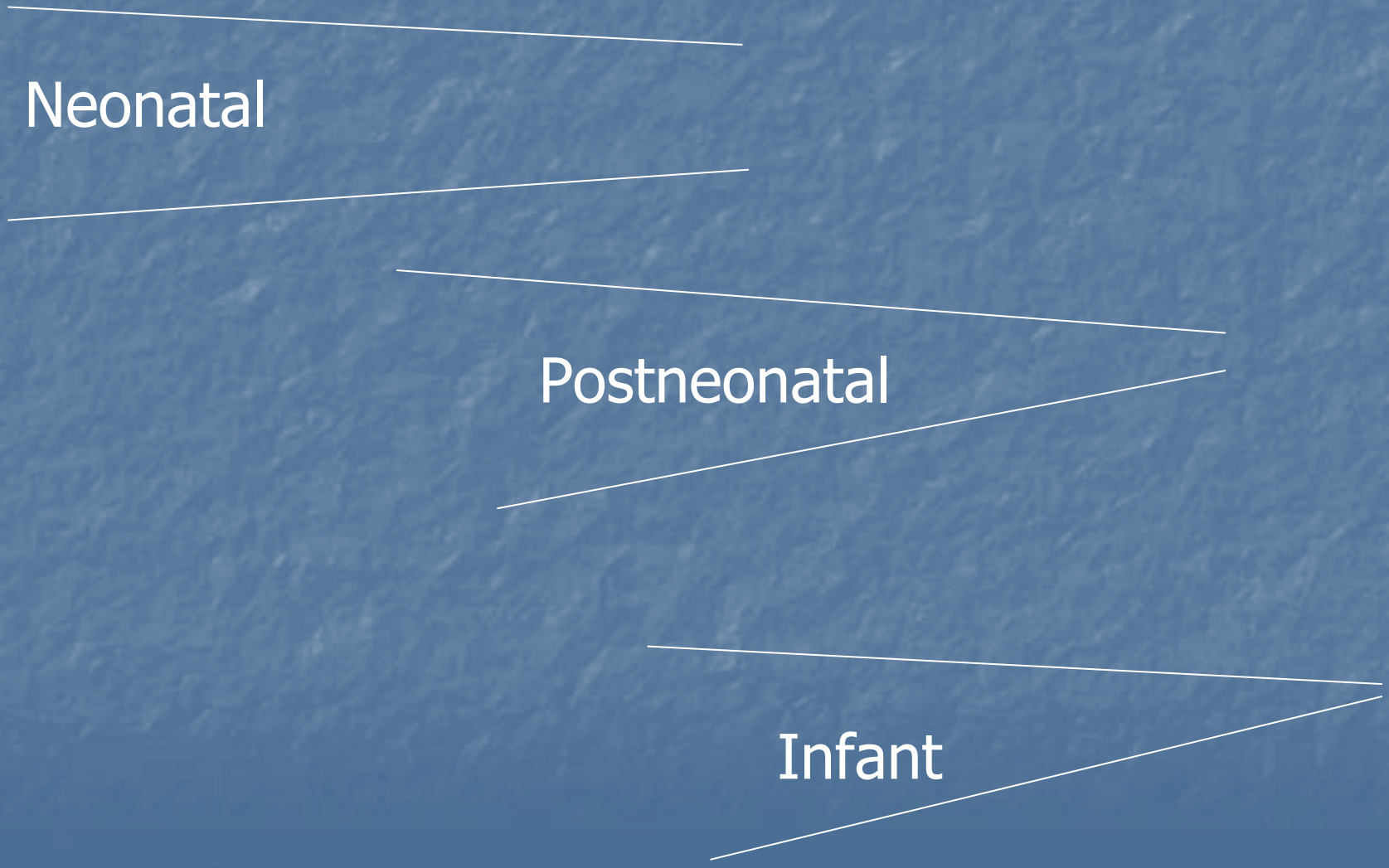
The downward escalade

- Since the 1990s neonatal mortality reduction has been smaller than postneonatal and infant mortality
- The proportion of under-five mortality rates due to deaths in the first month of life has been increasing
- The great component of neonatal mortality is by deaths occurring in the first week of life
- The great component of perinatal mortality is foetal death

The downward escalade



Relative decreasing rates of mortality



New strategies

- It is urgent to implement measure to reduce foetal and intrapartum deaths – about 2 million
- It is urgent to reduce deaths in the first week of life - ¾ of neonatal deaths

Darmstadt, 2010

Maternal and foetal outcomes at birth

- Sensitive indicators of the status of health systems
- They show the availability of rapid response to foetal and mother life-threatening conditions often unpredictable, access in time to a tertiary level of care and coordinated actions between obstetricians, paediatricians and midwives

Perinatal mortality rates

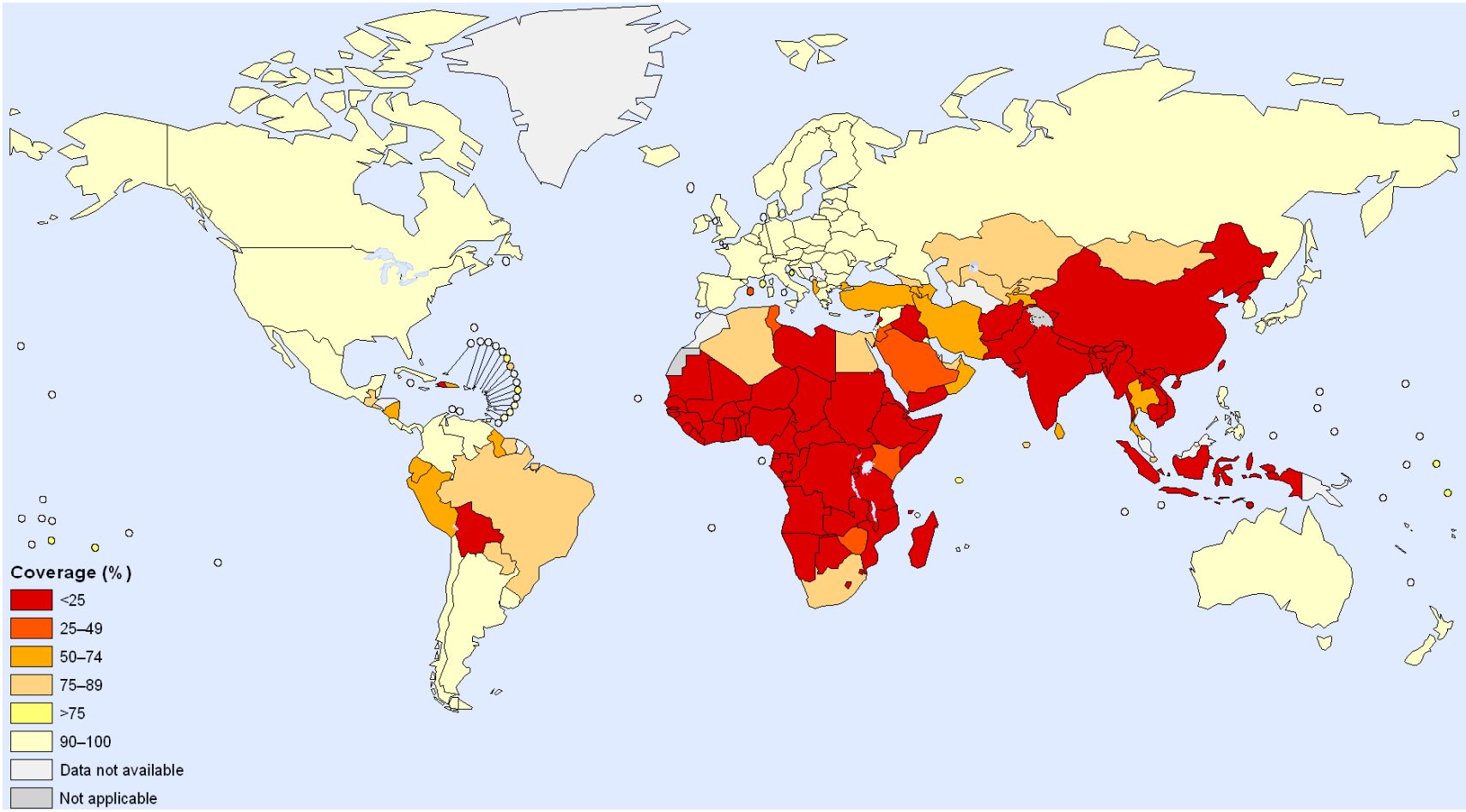
- The mirror of organization of perinatal care and the developmental grade of a society

Epidemiology
Difficulties

- Countries with vital statistics /reported rates (2009) – 33 *(Cousens, 2011)*
- Countries where the number of deaths have to be evaluated by estimates - 160
- No reliable data – 33

Other sources of knowledge: surveillance systems and household surveys

Coverage of vital registration of deaths, 2000–2008



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Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

World Health Organization

Bias
Different definitions
Gestational age to define abortion, stillborn

- WHO – 22 weeks, 500g, 25cm
- WHO - 28 weeks, 1000g, 35cm for international comparison
- USA (NCHS) - 20 weeks, 350g;
- UK - 24 weeks
- Portugal - 24 weeks - Directorate General of Health (excludes interruptions from statistics)
- Portugal - 22 weeks - National Institute for Statistics (official data; excludes interruptions from statistics)

Bias
Different definitions

- Ratio – stillborn per 1000 live births
- Rate - stillborn per 1000 live births and stillborn

The burden of the problem

The two components of the perinatal mortality

- **Foetal mortality** - 2/3 of perinatal mortality rates - bad knowledge on data and causes.
- Few programmes to decrease its rate.
- Unrecognised as a problem.
- Lack of research and searching for solutions
- **Early neonatal mortality - ¾ of all neonatal deaths** - better knowledge. Middle and high-income countries know their data and have well assessed programmes to decrease its rates

The burden of the problem

High-income countries

Reduction of infant mortality rates are obtained reducing early neonatal mortality

- Perinatal mortality: foetal/late foetal and **early neonatal.**
- Neonatal mortality: from birth to 28 days – **early neonatal** and late neonatal mortality
- Infant mortality: **neonatal** (**early** and late) and postneonatal

The burden of the problem

Low/middle-income countries

Reduction of infant mortality rates are obtained reducing postneonatal mortality

- Perinatal mortality: late foetal and early neonatal.
- Neonatal mortality: from birth to 28 days – early neonatal and late neonatal mortality
- Infant mortality: neonatal (early and late) and **postneonatal**

Stillbirth
A major public health problem not recognised

- The large contribution of stillbirth to perinatal death rates – about 30% in developed countires

Millennium Development Goals
WHO

1 -	Eradicate extreme poverty and hunger
2 -	Achieve universal primary education
3 -	Promote gender equality and empower women
4 -	Reduce under-five mortality of 2/3
5 -	Reduce maternal mortality 1990-2015 by 75%
6 -	Combat HIV/AIDS, malaria and others
7 -	Environment sustainability
8 -	Global partnerships for development

Goals in perinatal health

- "Adressing the health of mothers and newborns is fundamental to the achievement of not only MDGs 4 and 5 but also several other MGDs, most notably MGD1 (eradicate extreme poverty and hunger); MGD2 (achieve universal primary education); MGD3 (promote gender equality and empower women) and MGD6 (combat HIV/AIDS, malaria and other diseases)"

  Darmstad, *Sem Perinatol,* 2010

The orphan reality

- UN Millennium Development Goals 2015 – no mention on stillbirth
- Disability-adjusted life-years lost for stillbirth – not present in the Global Burden of Disease metrics
- The International Classification of Diseases does not identify the dead foetus as an individual death
- As stillbirth is not recognised as a death interventions to reduce them are not widely assessed

Is a stillborn different from a neonatal death?

- Both were alive before being dead and just some minutes may separate the two conditions
- Why being upset and searching for causes and trying to reduce neonatal death and do not do the same for stillbirth?

Perinatal mortality data

- Dependent on the perinatal organization, definitions, policies, economics, social and ethnic conditions, religious believes, women´s rights, etc
- Perinatal mortality data are neither consistent nor correct: in low-income countries because they are not registered; in high-income countries because definitions are not uniform vg different Estates of the US

Dependence on the angle of vision

- In high-income countries the scale is small; personal problems have a great impact; psychological and decisional issues are prominent
- In low-income countries, problems are discussed by region, country or continent and are related to public health care, organizational and sanitary conditions. Personal problems are left hidden under the veil of the “usual” high mortality rates as if there were no psychological effects on the mother /family

Problems

- High-income countries – the scope of the problem is known: numbers and causes are published. Deviations are diagnosed and correction is possible
- Low-income countries – neither the true burden of the problem is known nor its causes, making difficult to implement cost effective interventions

Evolution?

- "Stillbirth rates in low-income countries are now where they were in high-income countries 50 to 100 years ago"

  Froen JF et al Lancet 2011

- It is estimated that stillbirth rate has declined by 14.5% from 1995 to 2009 (from 22.1 stillbirth/1000 births to 18.9 stillbirths/1000 births *(Cousens, 2011)*

The burden of the problem

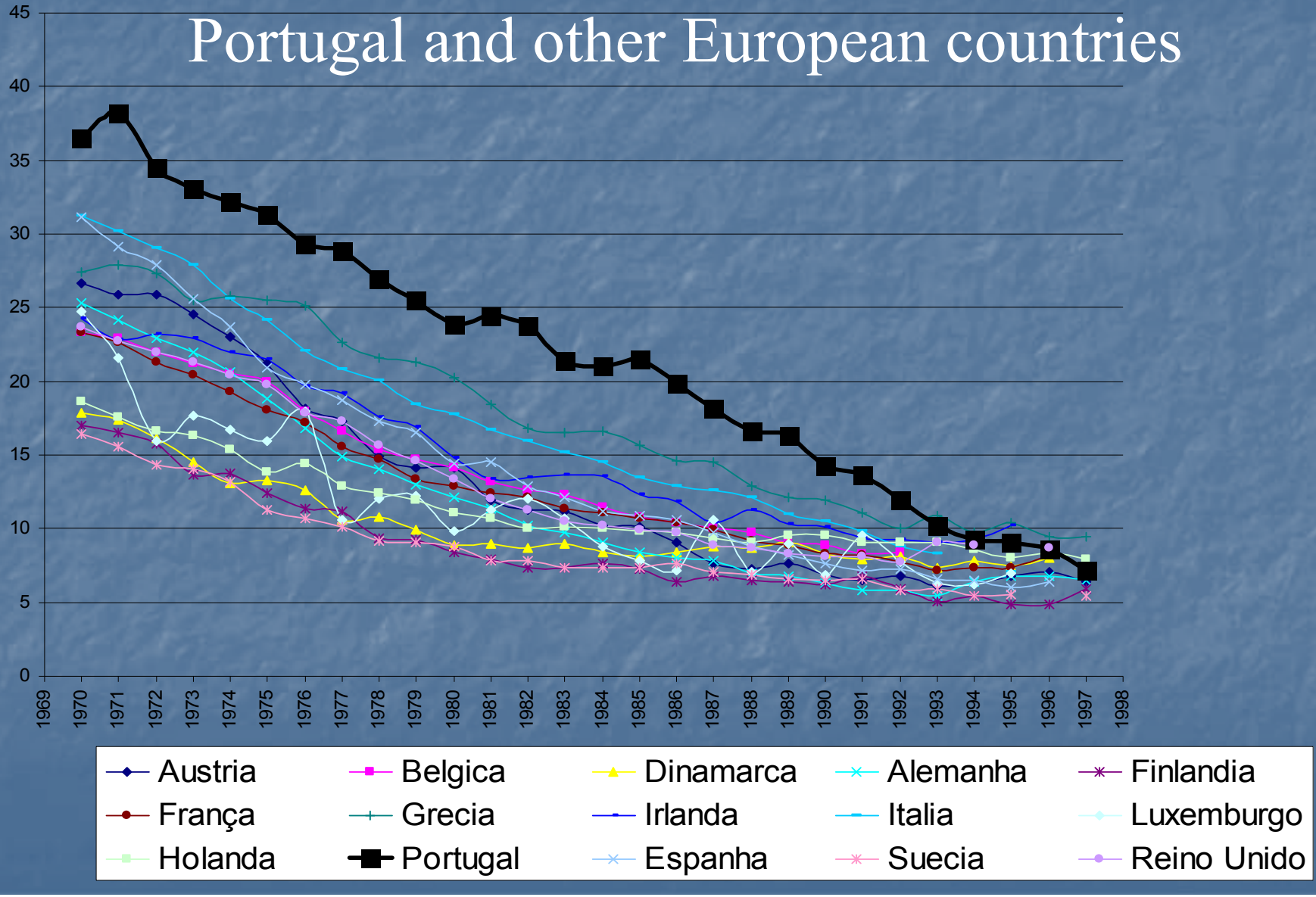
-
- Reduction of neonatal mortality is closely linked to health care delivered to the mother at any time – before and during pregnancy and during delivery
- Mother, foetal and neonatal mortality rates will profit from the same policies

- Stillbirth is not just a low-income country problem
- In 2008 in the UK stillbirths account for two-thirds of perinatal death.
- In 2009 in Portugal foetal death accounted for 63.8% of perinatal deaths
- Despite being much more frequent than other paediatric conditions, programmes and funding for research are scarce

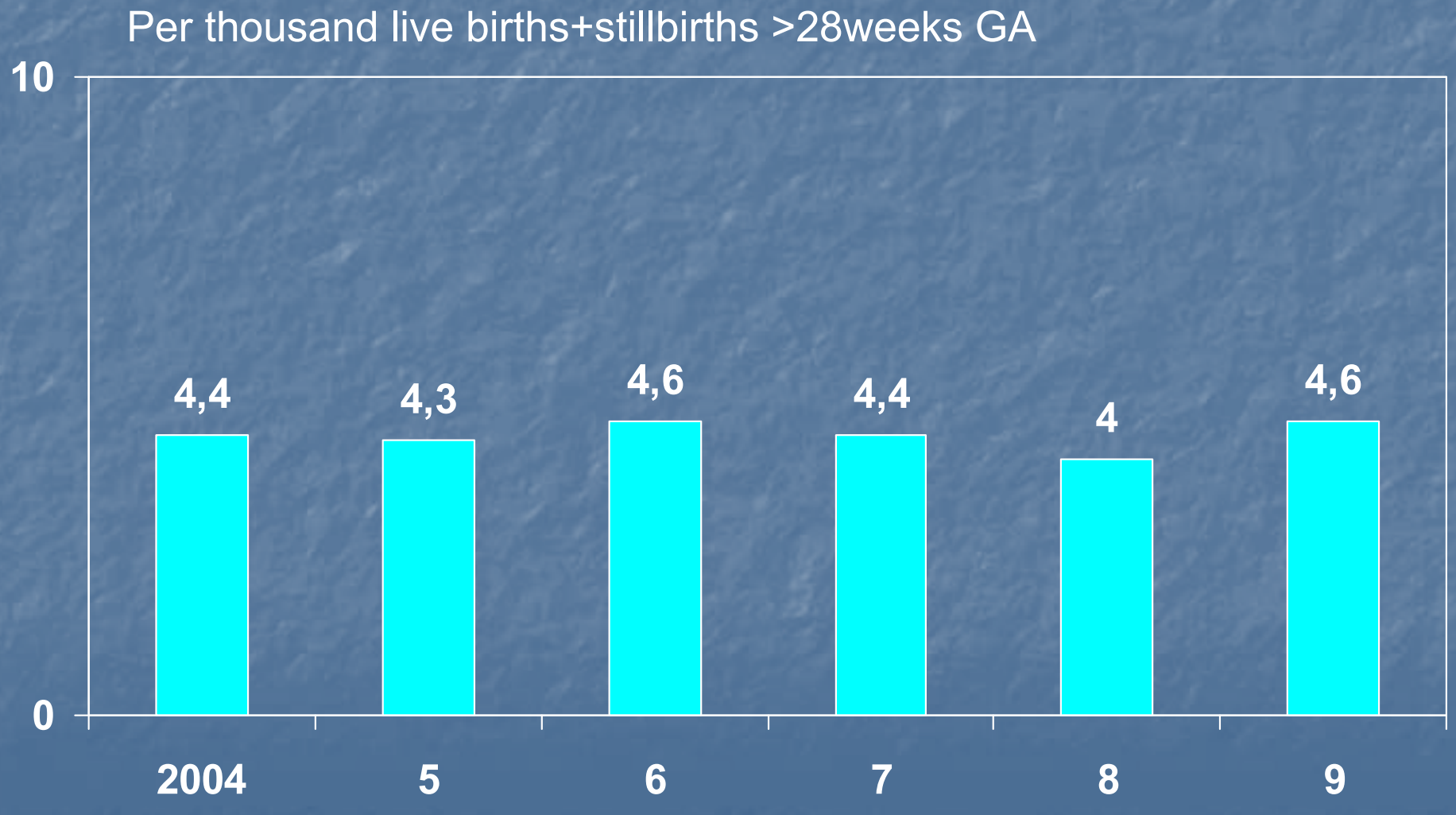
Source: Directorate-General of Health – Epidemiological Division

Perinatal mortality rate

Portugal and other European countries

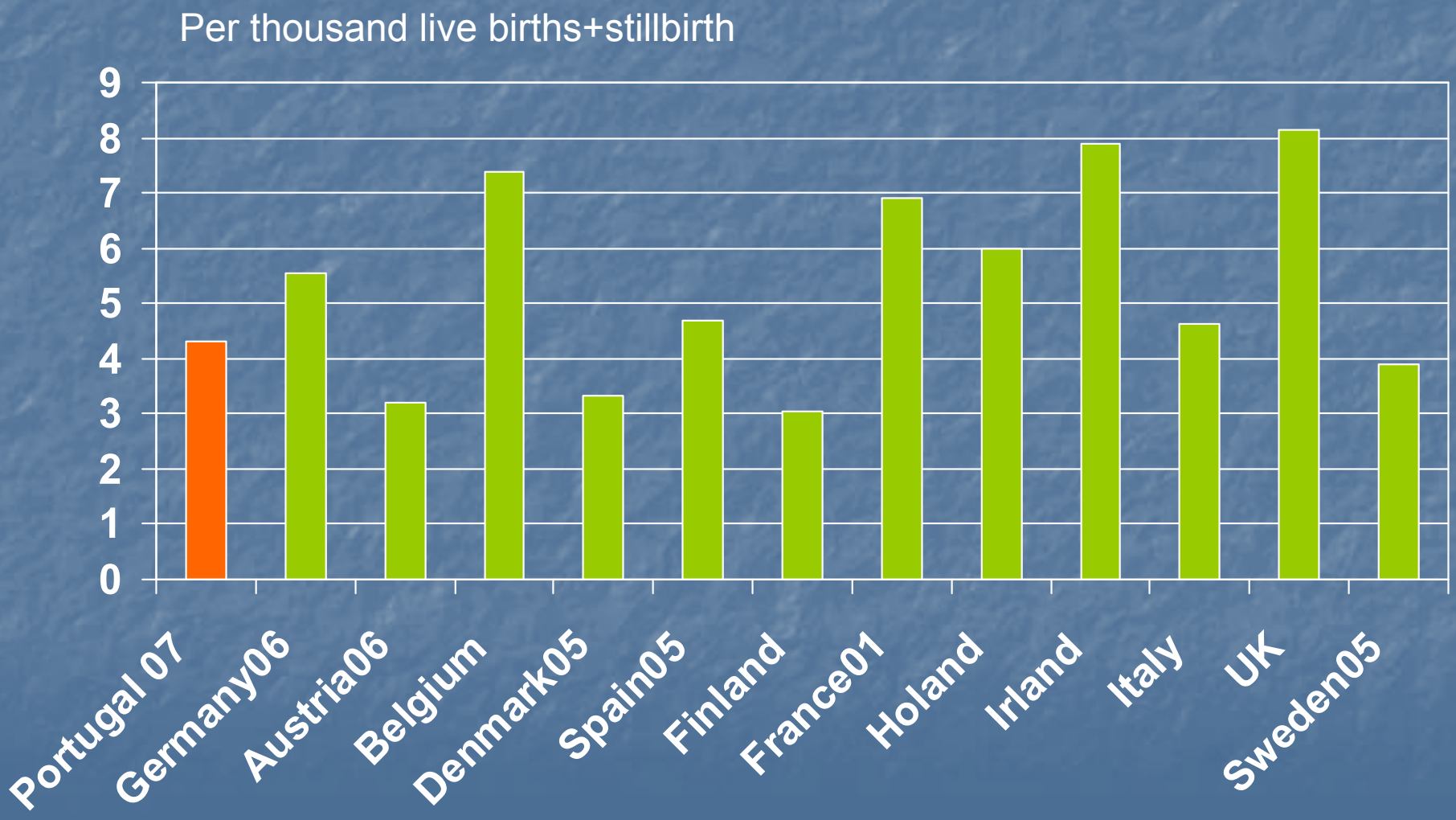


Perinatal mortality rate in Portugal (2004-2009)



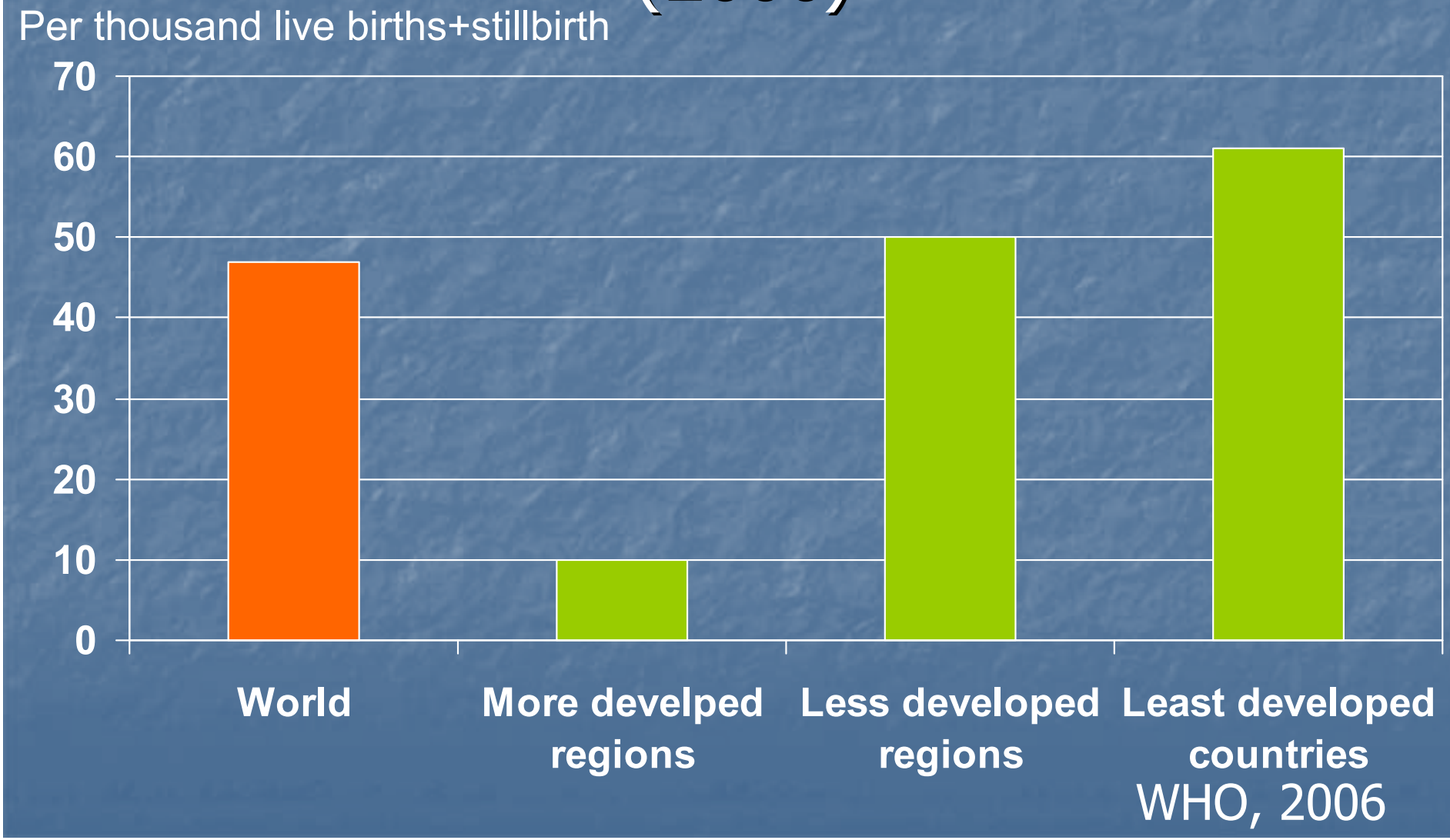
Source - INE 2010

Perinatal mortality rate in EU
(2005-2007)



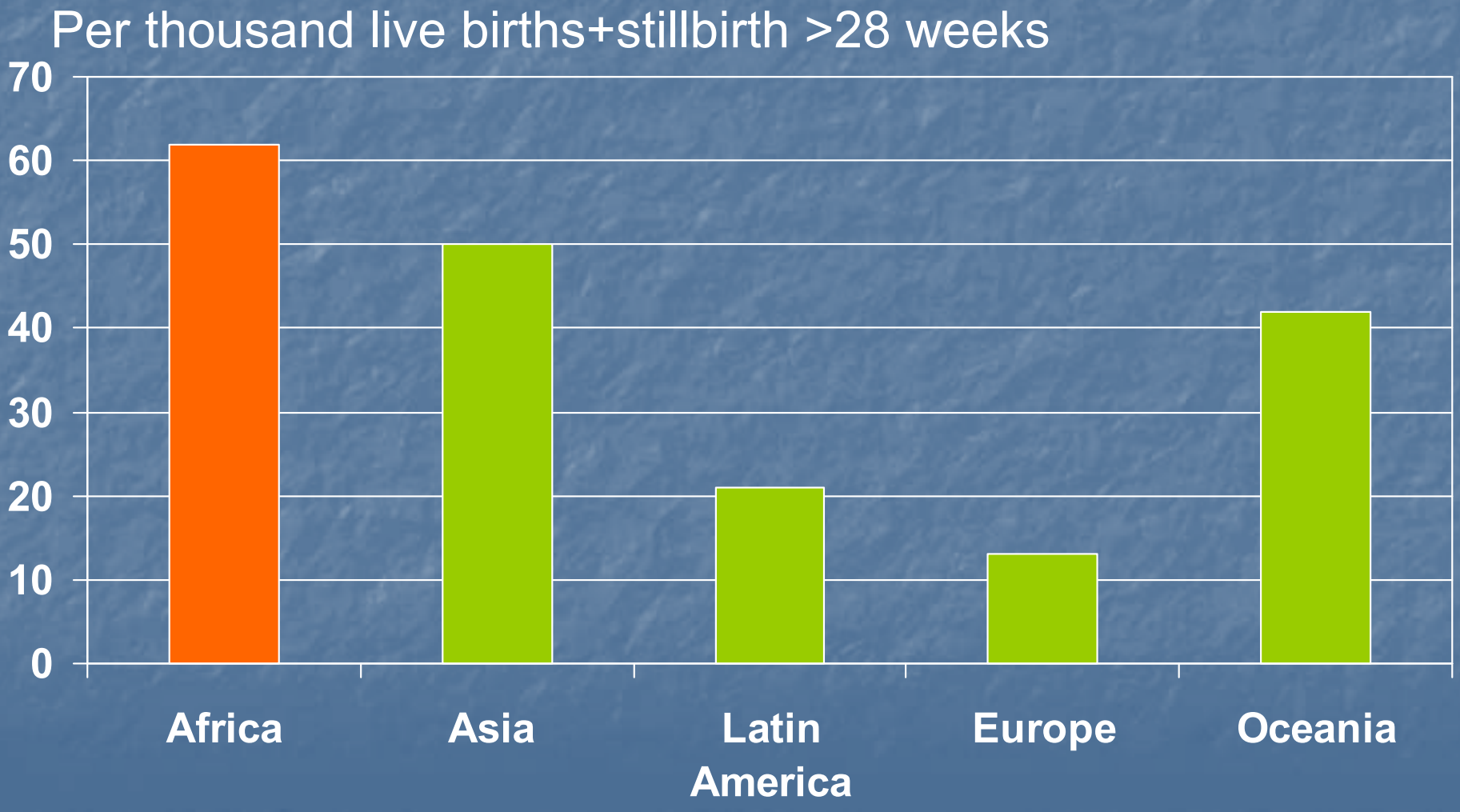
WHO/Europe 2008

Perinatal mortality rate by level of development (2000)



WHO, 2006

Perinatal mortality rate by regions (2000)

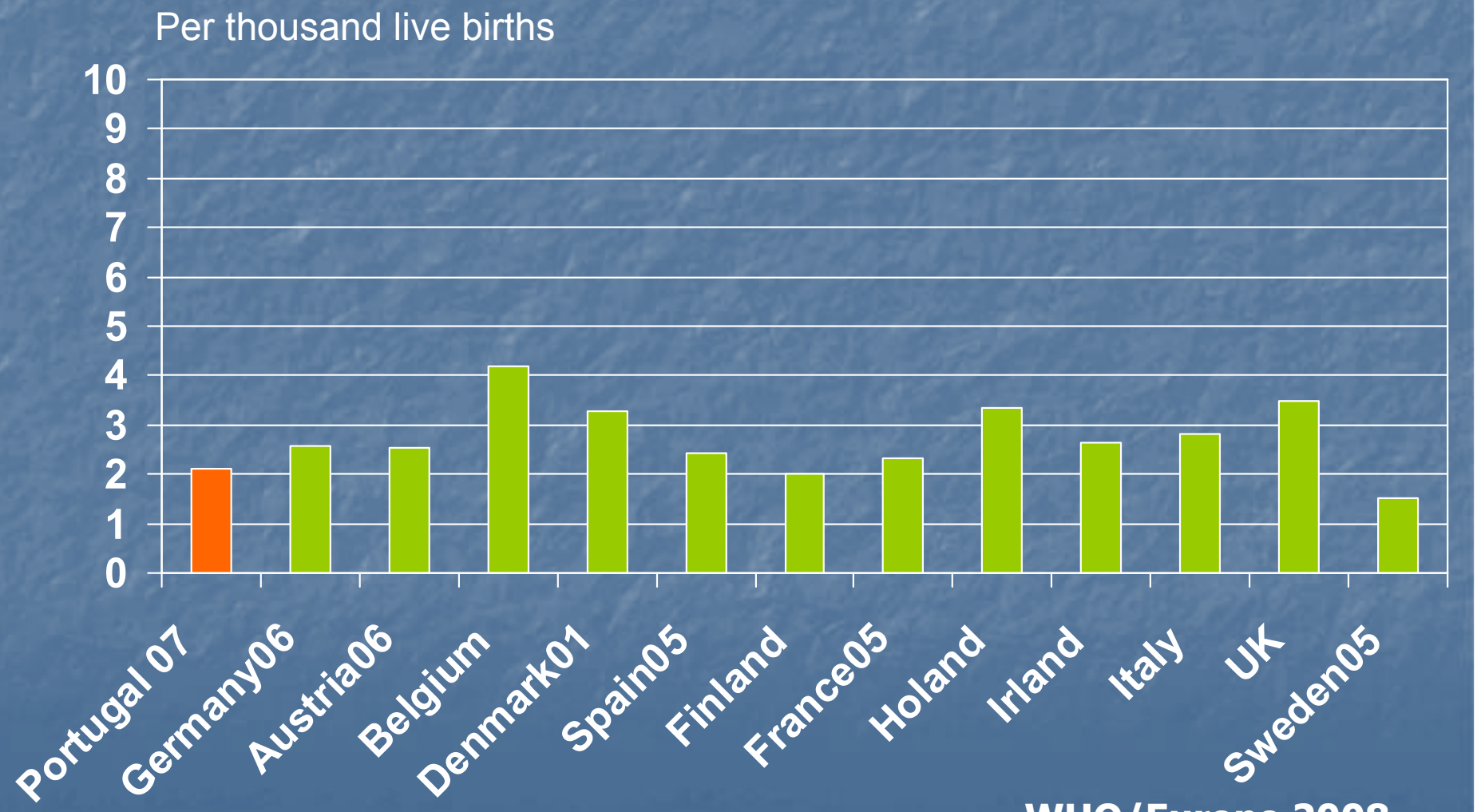


WHO, 2006

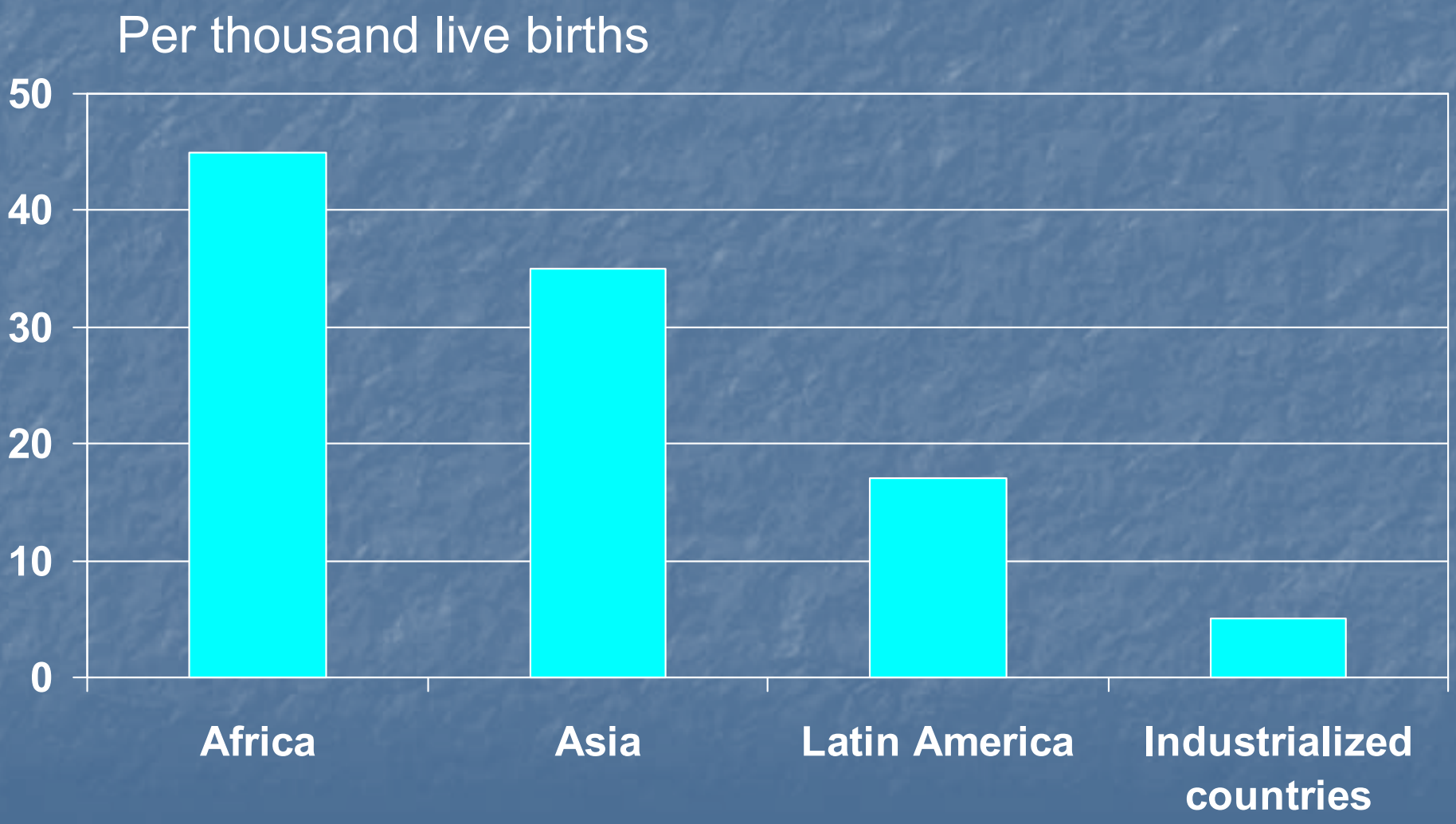
Neonatal mortality rate (/1000LB) in Portugal

Source: INE

Neonatal mortality rate in EU (2005-2007)

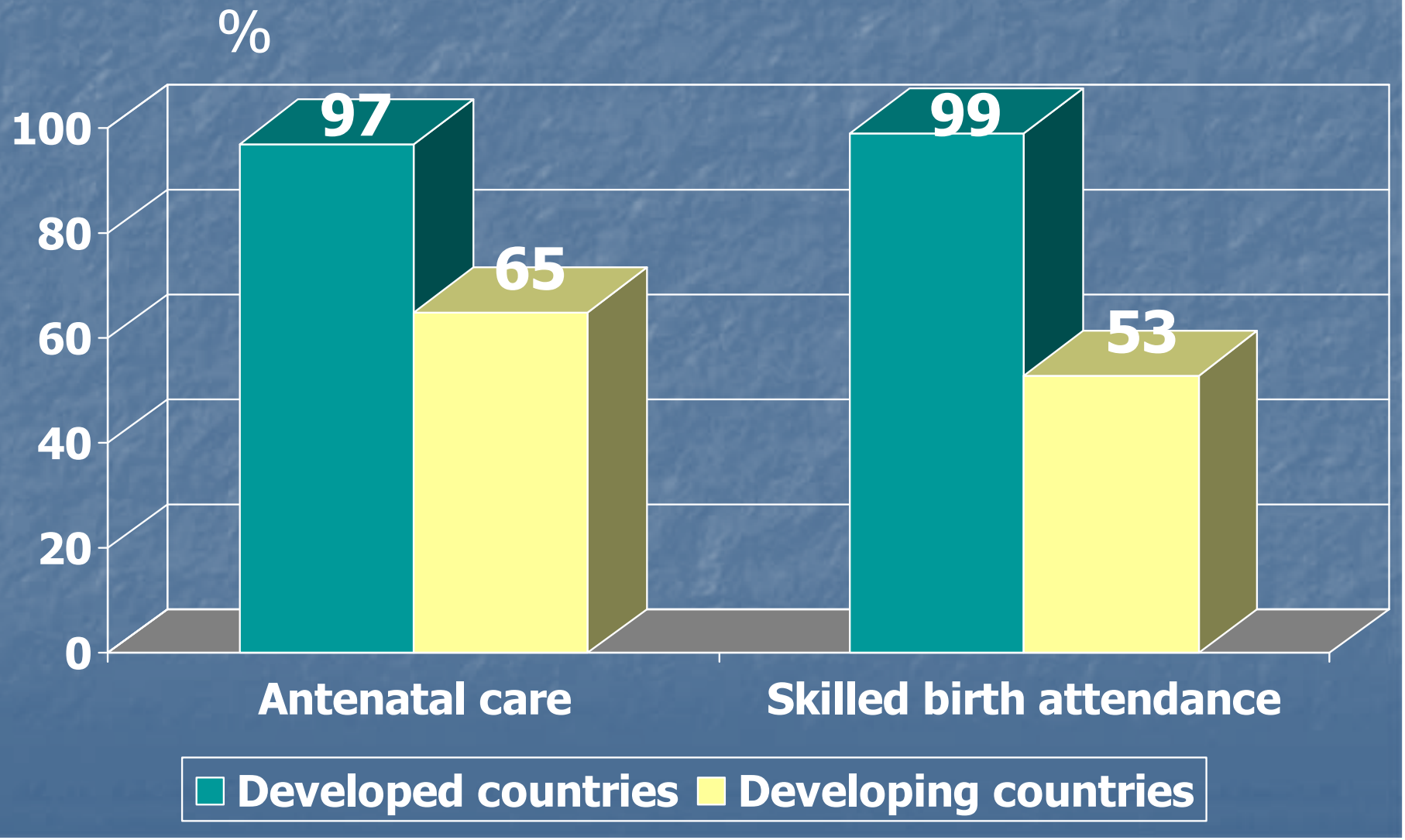


Neonatal mortality rates by region



WHO/Health Monitor, January 2004

Coverage of maternal health services



USA - Race and ethnic disparities

*Hogue et al 2011 **

- Assume there is a clear disparity for stillbirth rates for the non-Hispanic black deliveries that prevailed throughout the 20th century and into the 21st century.
-

**Semin Perinatol* 2011; 35: 221-233

USA - Race and ethnic disparities

*Hogue et al 2011 **

- In a review of the literature many factors were analysed: Socio-demographic conditions, reproductive history, behavioural and pre-pregnancy health factors, maternal medical disorders, factors in current pregnancy
- Conclusion: "Although many factors including genetics, environment, stress, social issues, access and quality of medical care and behaviour contribute to racial disparities in stillbirth the reasons for the disparity remain unclear.
  - **Semin Perinatol* 2011; 35: 221-233

USA - Race and ethnic disparities

*Hogue et al 2011 **

- In USA nonwhites did achieve the 1945-level stillbirth rate of whites 26 years later, in 1972
- The non-Hispanic Black stillbirth rate in 2005 was similar to the total white rate in 1990 – a gap of 15 years
- Also improvement of stillbirth rates was higher for non-Hispanic white than for non-Hispanic black people
- **Semin Perinatol* 2011; 35: 221-233

Etiology

Etiology
The importance of knowing it

- To evaluate the avoidable cases *(Flenady , 2009)*
- To identify the underlying conditions of foetal death and the chain of events leading to it *(Flenady, 2009)*
- To identify deficiencies in the provision of care *(Whitfield, 1986)*
- To know were to implement corrective measures

Causes of death
Difficulties

Foetal death	Classifications of perinatal death *(Flenady, 2009):* 33 new systems and a further 12 modifications of them; 3 on stillbirth only. Non-registration of causes of stillbirth in low-income countries
Neonatal death	Classification of causes available in high-income countries but wide variation. By spoken autopsy in low-income countries

Causes of death
Difficulties

- Stillbirth may be faced by the mother as a fatality
- In many countries the stillborn is not given a name, neither have a funeral nor is dressed or held by the mother
- In many regions it is a non-event. In others it a non-counted event
- It may be hidden because of shame, superstition or supposed lack of care by the mother
- Stigmatising woman as a failed mother, spouse

Problems

- "Although the causes of stillbirth are poorly understood they are associated with conditions that are inherently dangerous to women´s health: obstetric emergencies such as eclampsia or underlying infections and diseases as malaria, syphilis, chorioamnionitis"

Maurenn Kelley, Lancet, 2011

Macro scale – Worldwide
Causes of perinatal death

Causes of stillbirth and early neonatal death have similar obstetric origin and are related to place of delivery or miss of skilled birth attendance

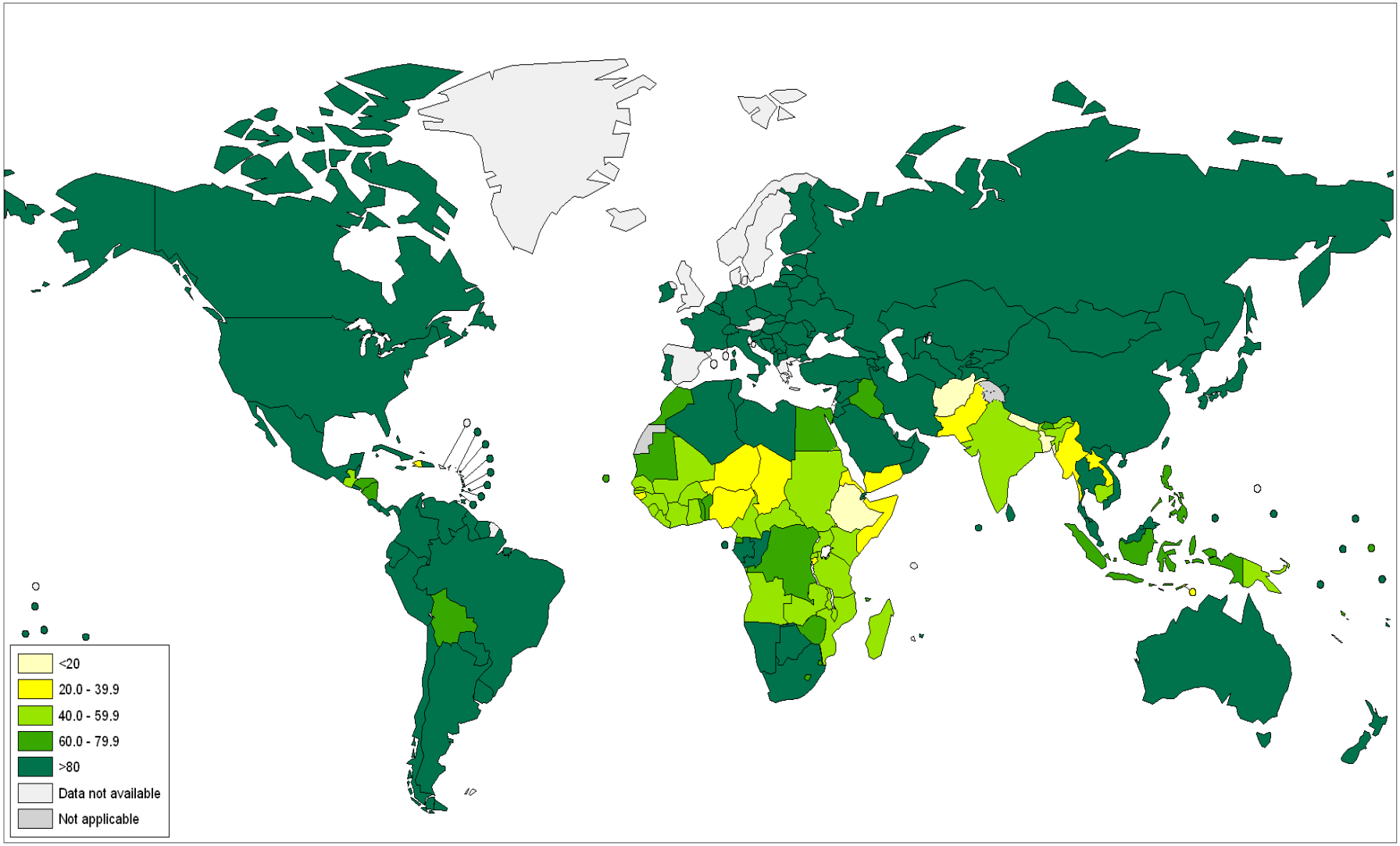
Macro scale – Worldwide
Causes of perinatal death

- **Asphyxia** may cause stillbirth or post natal death: obstructed labour, eclampsia, abruptio placenta, foetal malpresentation, umbilical cord complications
- **Infection,** responsible for 26% of deaths: bacterial - prolonged labour or prolonged rupture of membranes; neonatal tetanus, syphilis, malaria, HIV
- **Prematurity:** under nutrition, twins,
- **Malformations:** undiagnosed, the smallest percentage <5%

Health-care workers in perinatal medicine

- Estimated numbers needed to ensure skilled assistance to 80% of all births – 23 doctors, nurses and midwives /10 000 people
- Maternities in sub-Saharan Africa with skilled staff and equipment needed to perform neonatal resuscitation – 15%
- In high-income countries an excess of doctors and nurses is the rule

Proportion of births attended by skilled health personnel (%), 1993 - 2010



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Skilled birth attendance

- Training in neonatal resuscitation in health care facilities would avert 30% of intrapartum-related neonatal deaths

Caesarean section rates

Low-income countries	2%-5% Or/and when feasible
High-income countries	28%-35% And on demand

The first five causes of stillbirth

USA 2006	Portugal	UK	Southeast Asia	Worldwide

Causes of neonatal death

Africa	UK	Southeast Asia	Worldwide
Asphyxia	Immaturity-related conditions	Diarrhoeal diseases	Preterm birth
Prematurity and low birth weight	Congenital malformations	Tetanus	Neonatal infections (1/3 to ½)
Infection		Pneumonia or sepsis	
Congenital malformations		Preterm birth complications	
		Birth asphyxia	

The first five causes of infant death

USA 2006	UK	Southeast Asia
Congenital malformations	Congenital malformations	Diarrhoeal diseases
Disorders related to short gestation	Immaturity-related conditions	Malaria
SIDS	SIDS	Pneumonia
Maternal complications of pregnancy		Measles
Accidents		Meningitis

Causes of death - Portugal 2004 -2005
From 24 weeks to 28 days
(Wigglesworth modified)

	2004	2005
Before labour	61,1%	54,8%
Associated to immaturity and preterm delivery	21,1%	18%
Congenital malformation	14,5%	9,2
During labour	7,4%	11,4%

Causes of death in Portugal 2009

Neonatal deaths	**Congenital anomalies**	**12,2%**
	Gestation and foetal growth problems	10,6%
	Respiratory diseases	8%
	Others	69%
Infant deaths	**Congenital anomalies**	**14,3%**

Source: INE 2010

Levels of commitment

Public facilities	Health care organization	Control of infectious conditions*
Water	Skilled birth attendance	Vaccines
Waste	Prevention of prematurity	Screening
Food		Prevention
		Treatment

*Malaria, syphilis, tetanus, HIV, diarrhoea

Malformations

- Assessment of preventive measures
- Access and acceptance of antenatal diagnosis and termination of pregnancy
- Access to and acceptance of treatment for infants born with congenital malformations

Major gaps in knowledge

- Number of foetal deaths in low/middle income countries
- Number of early and late neonatal deaths in countries without vital statistics

- Causes of preterm birth
- Causes of stillbirth
- Causes of neonatal deaths in countries without vital statistics

Possible interventions
General

- Comprehensive emergency obstetric care
- Tetanus toxoid immunization
- Antibiotics for preterm premature rupture of membranes
- Antenatal steroids in preterm labour
- Active management of the third stage of labour
- Neonatal resuscitation

Bhutta, 2011

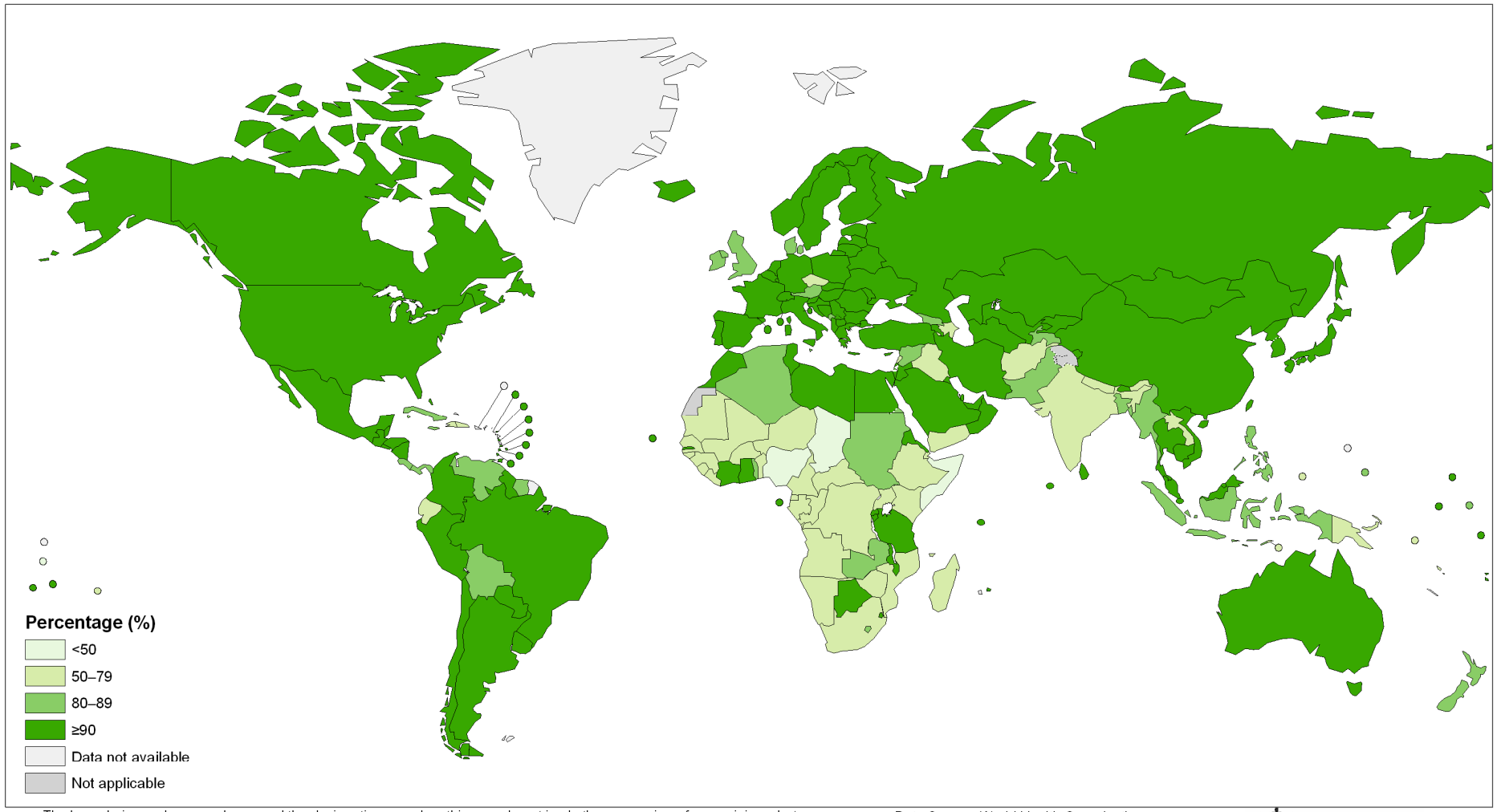
Possible interventions
Local-related

- Malaria prevention
- Screening and treatment of syphilis
- Routine induction of labour at 41 weeks in high capacity health-care systems
-

Bhutta, 2011

Conclusion

Proportion of one-year-old children immunized against measles (%), 2009



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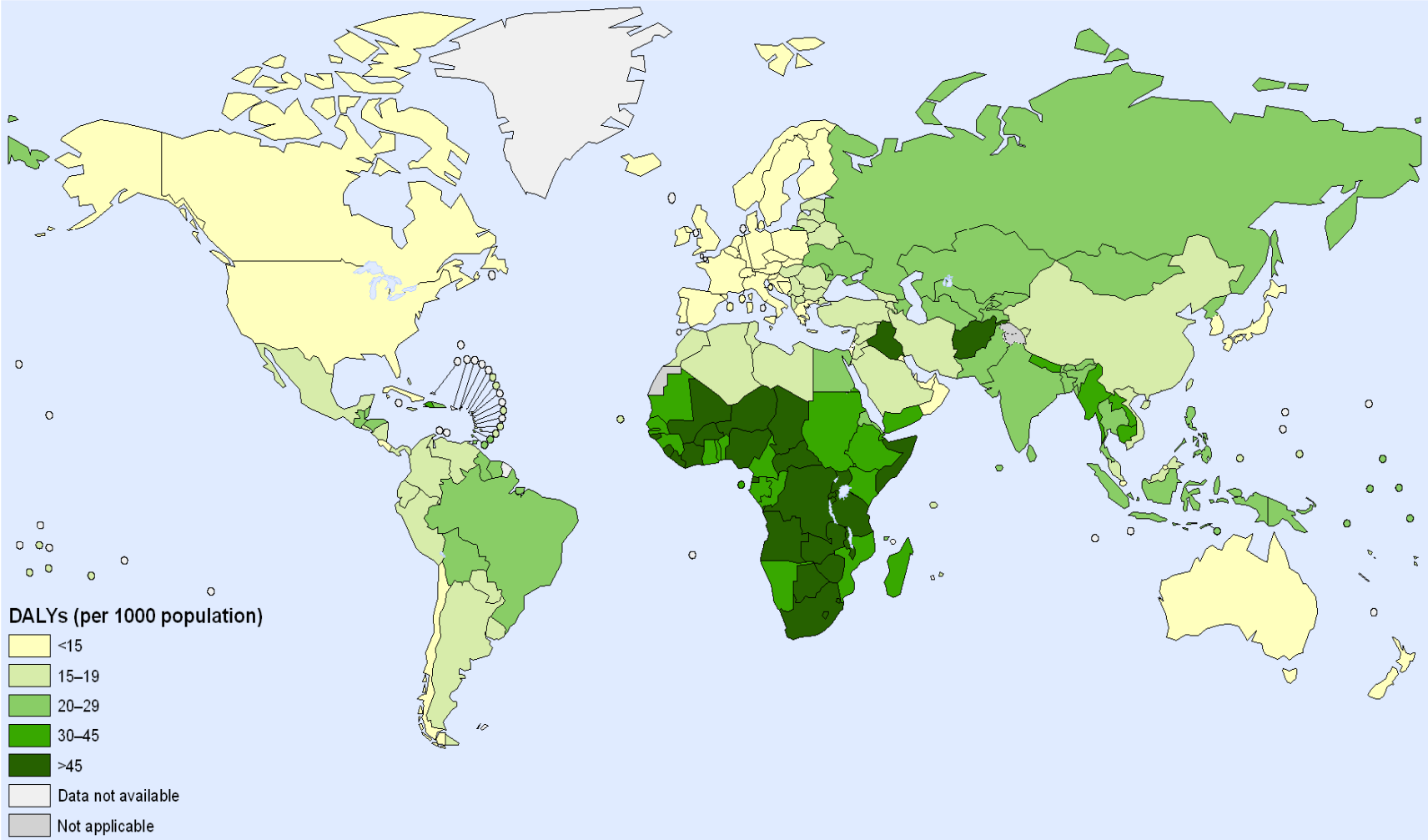
Age standardized disability-adjusted life year (DALY) rates, 2004



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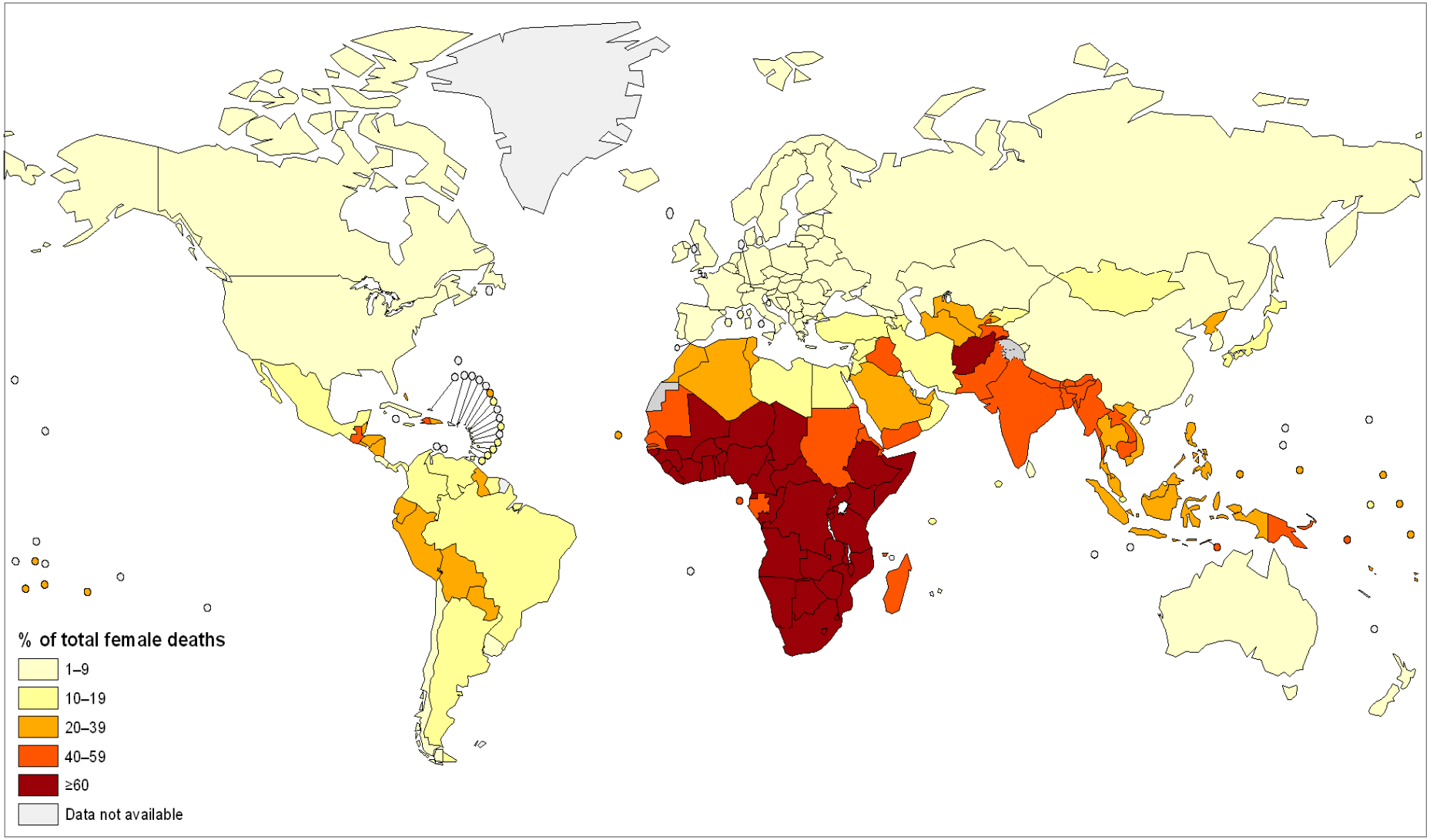
Women's deaths from communicable, maternal, perinatal and nutritional conditions as a percentage of total women's deaths, 2004



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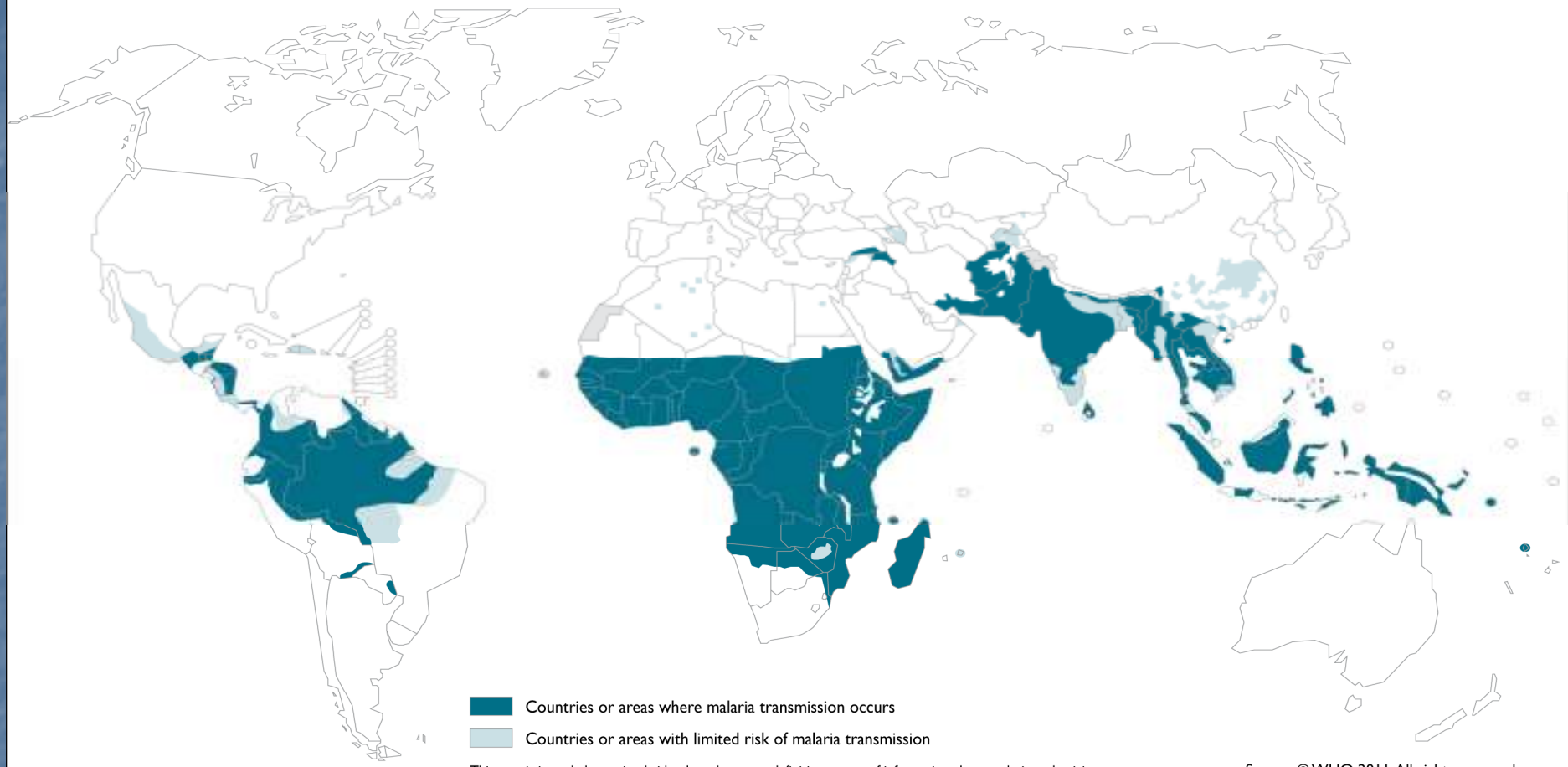
Malaria, countries or areas at risk of transmission, 2010



This map is intended as a visual aid only and not as a definitive source of information about malaria endemicity.

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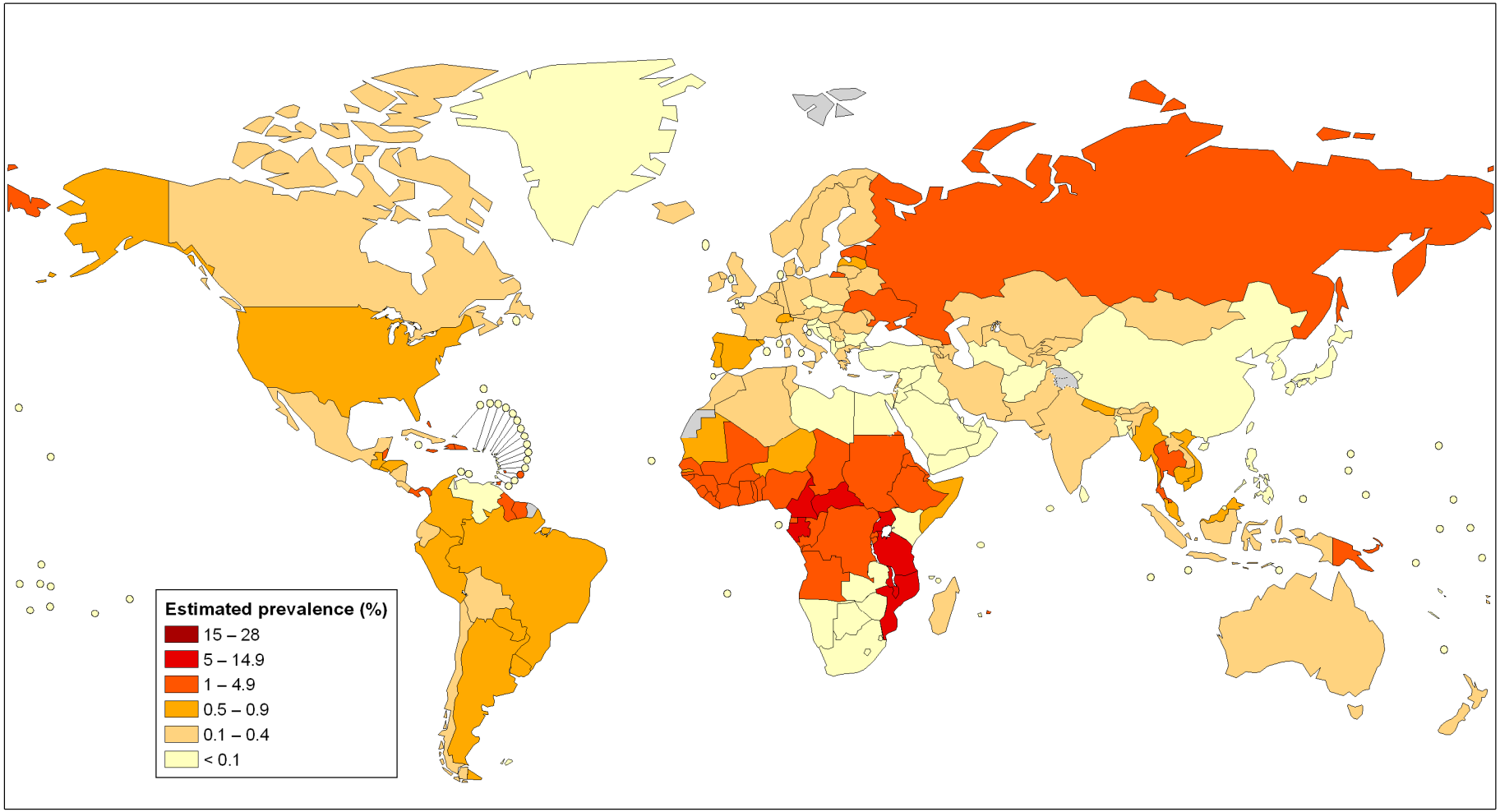
World Health Organization

HIV estimated prevalence among population aged 15–49 years (%), 2007



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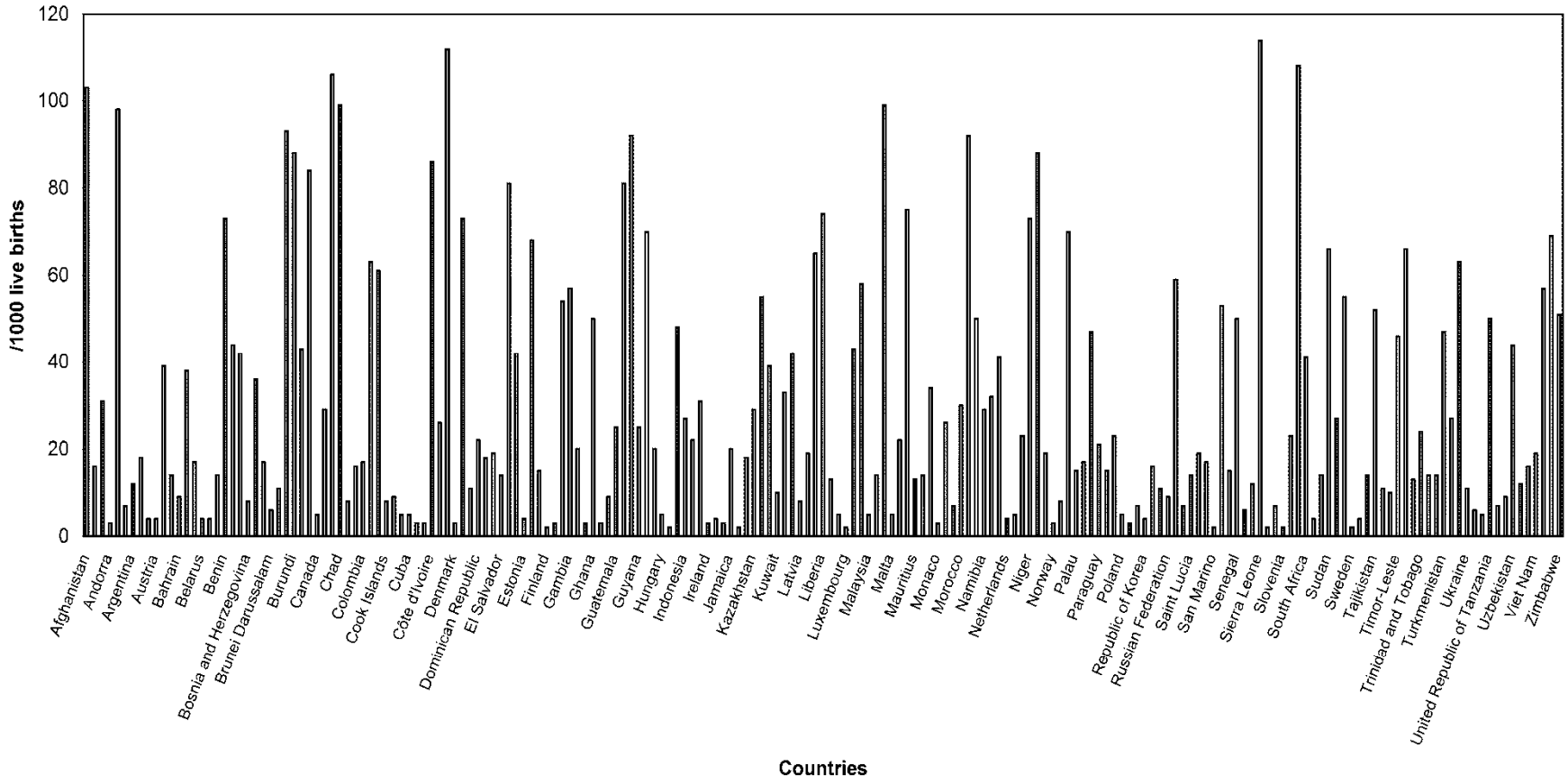
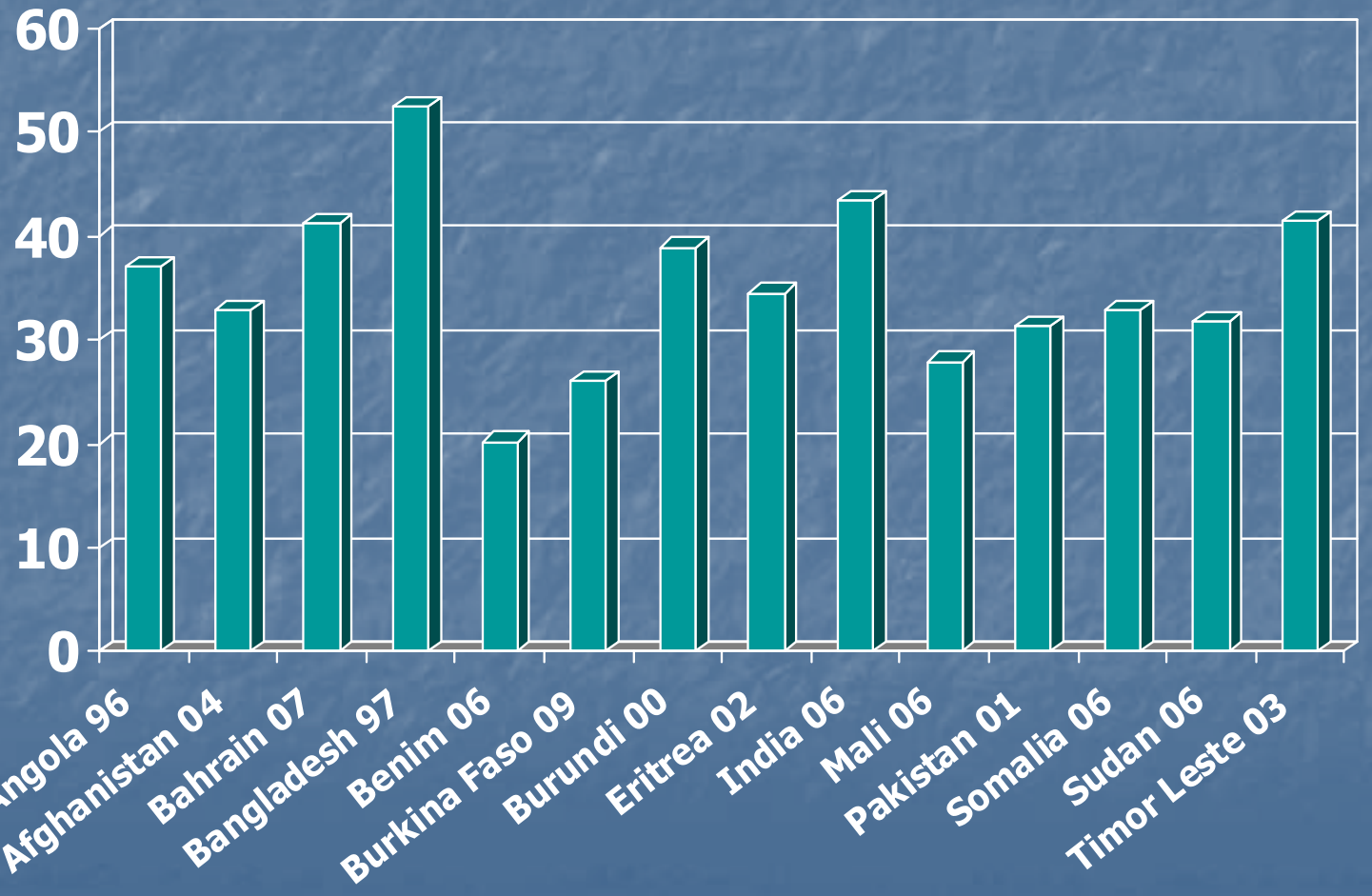
INFANT MORTALITY RATES BY COUNTRY 2010



Source WHO

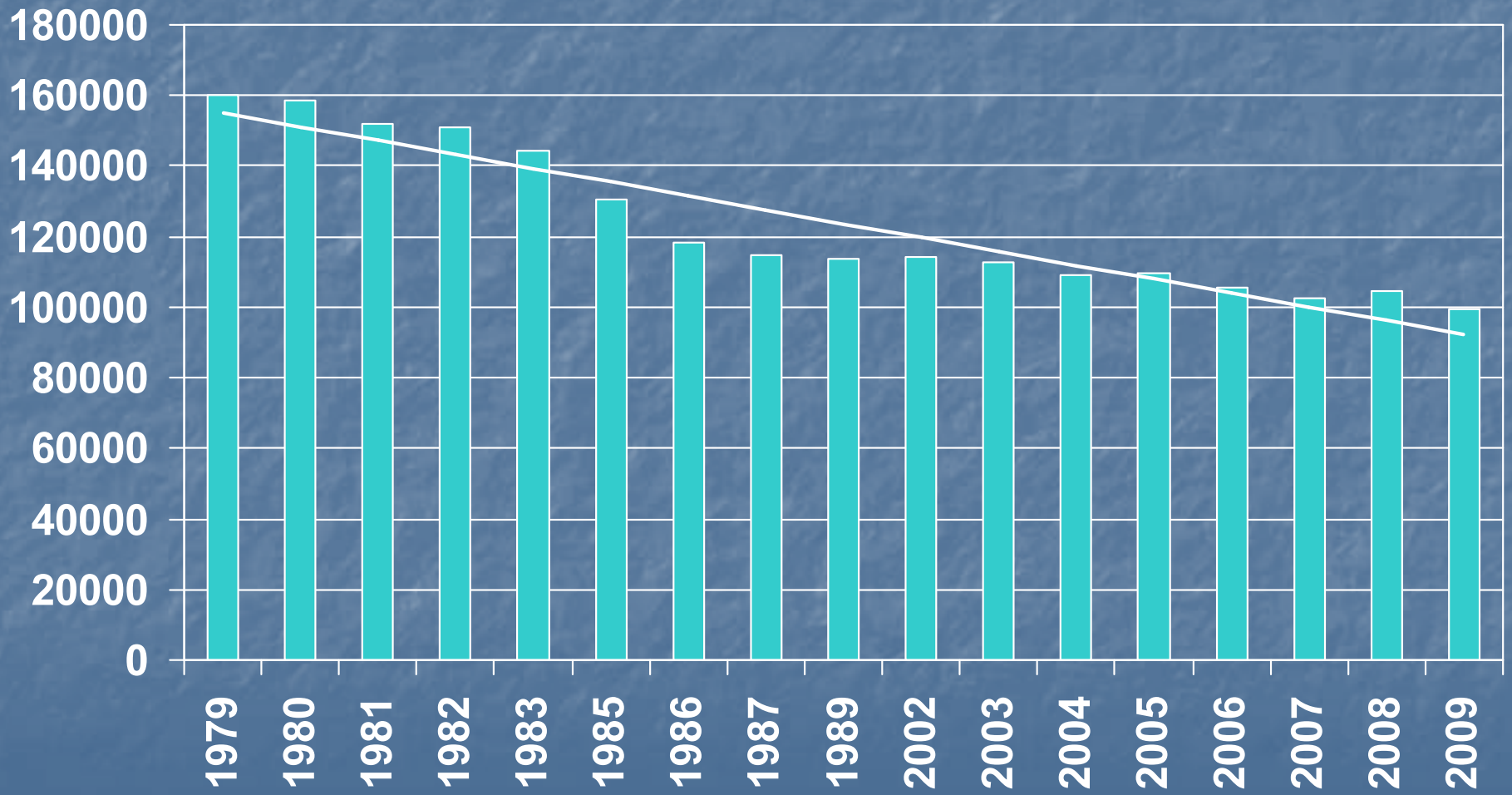
Children´s malnutrition Underweight



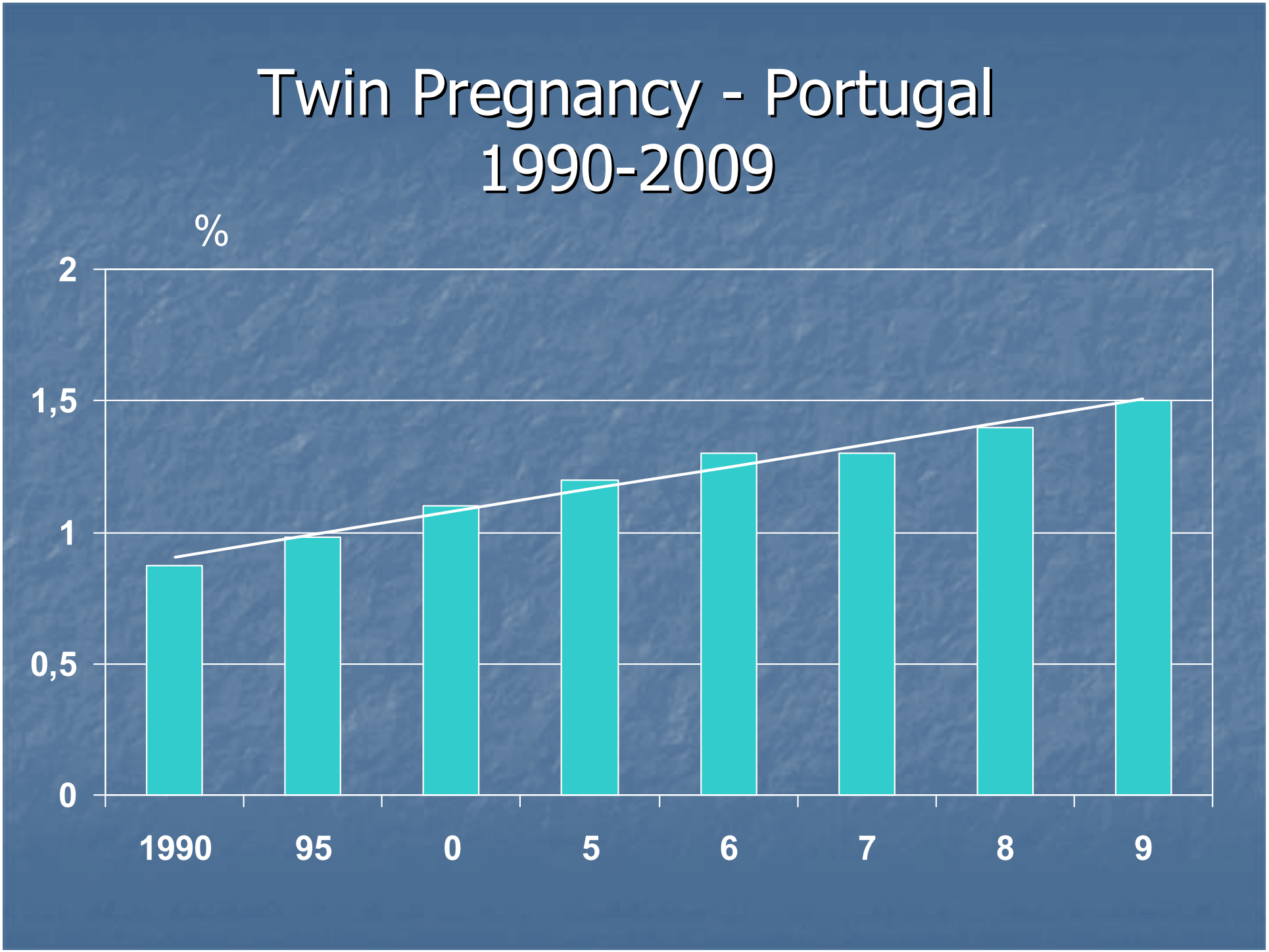
The burden of the problem

- 7.6 million children under five died in 2010 (57/1000 live births)
- 70% of this mortality occurred in the first year of life
- In 2008, 64% died because of infectious diseases – pneumonia and diarrhoea accounting for one-third of all under five death

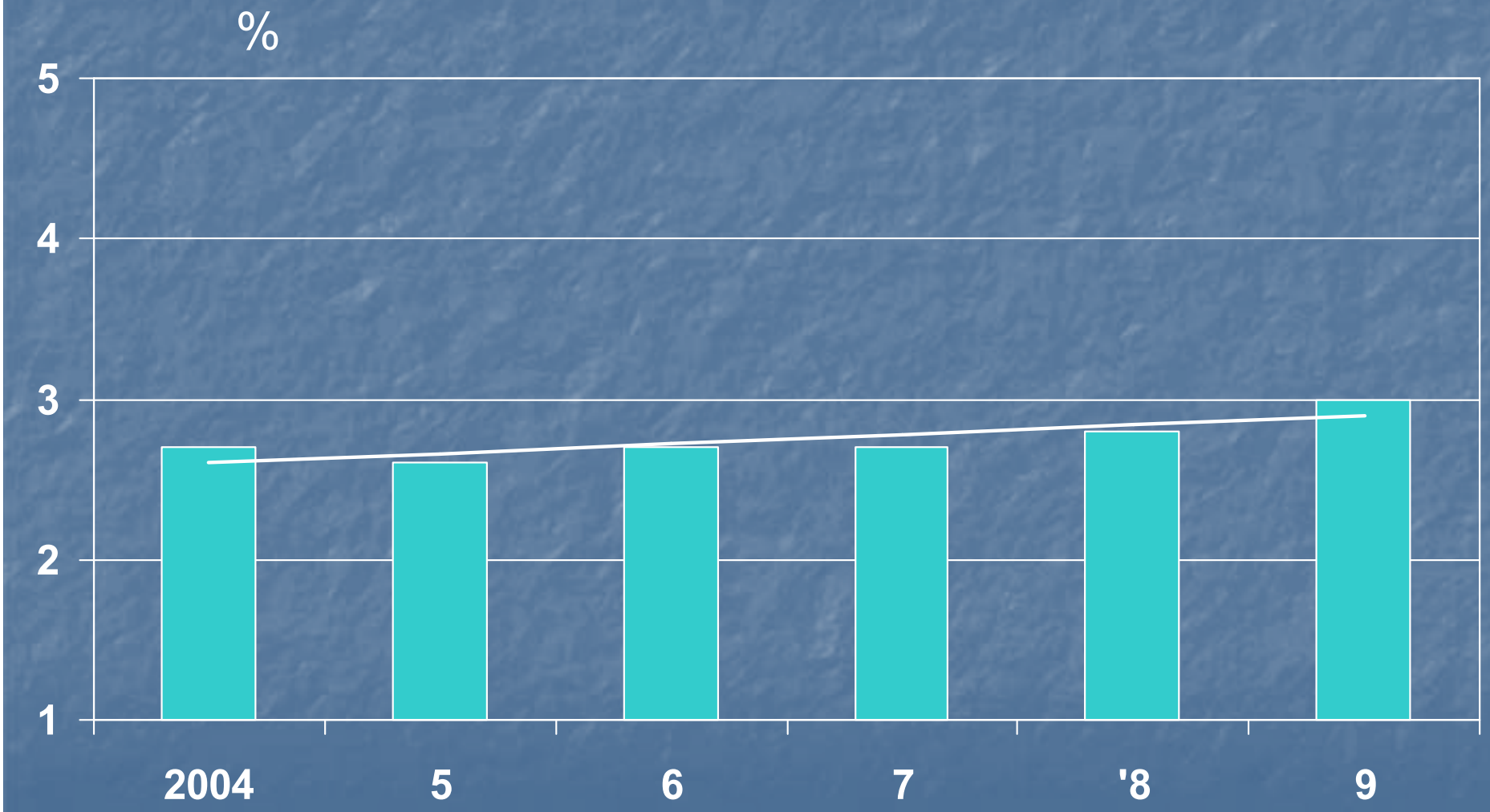
Portuguese birth rate (1979-2009)



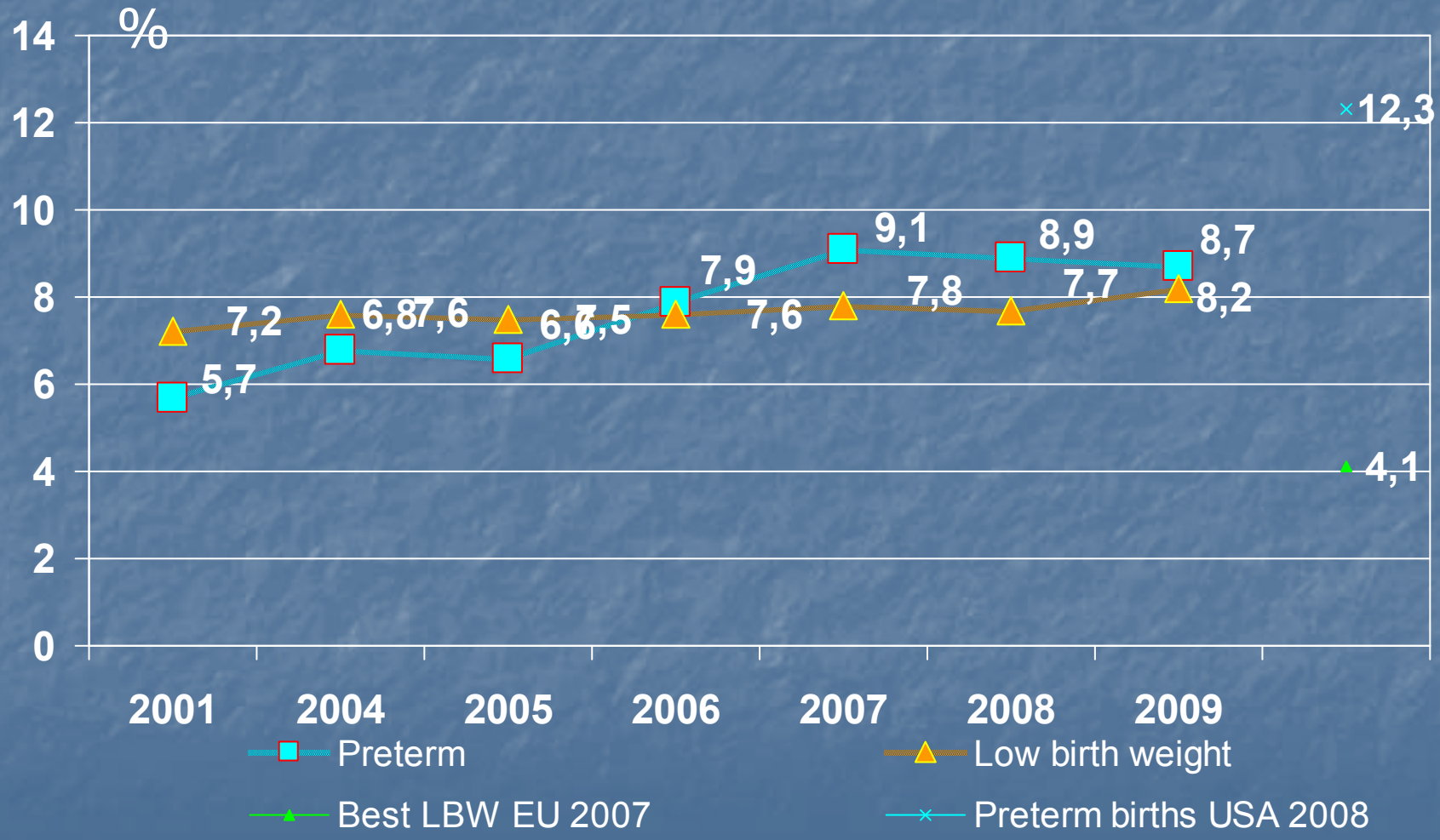
Twin Pregnancy - Portugal 1990-2009



Twins - Portugal
2004 -2009



Preterm and low birth weight rates Portugal



Source INE 2010